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The Division of Building Research

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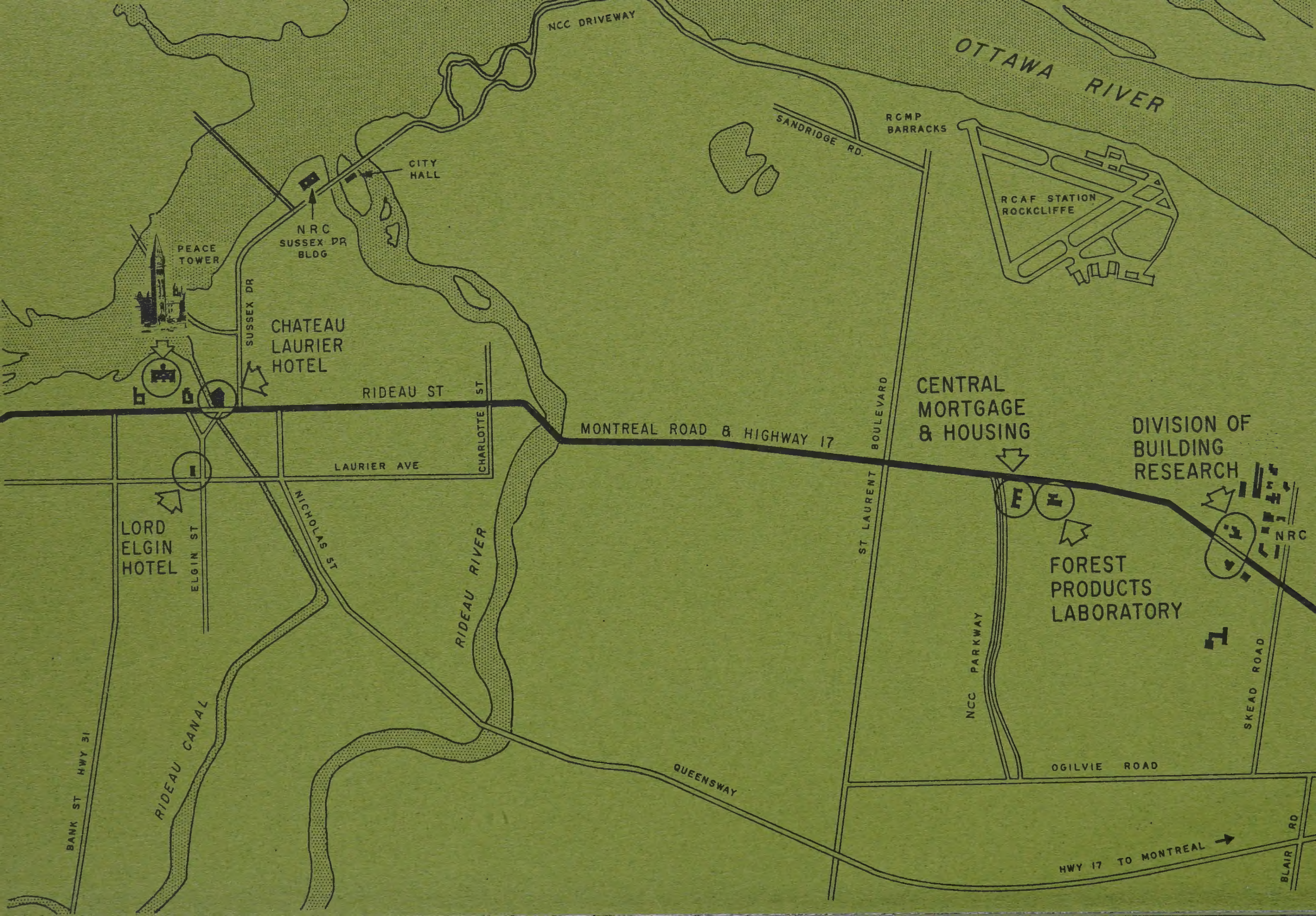
NRC No. 4879
(third edition)

NATIONAL RESEARCH COUNCIL
OF CANADA, OTTAWA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NATIONAL RESEARCH COUNCIL
OF CANADA

The Division of Building Research

• What it is

• What it does

Ottawa (third edition) NRC No. 4879

Rec'd: 12.3.70
Order No.: -
Price: Gift
Acc. No.: Canada NRC

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DIVISION OF BUILDING RESEARCH

The Division of Building Research was established by the National Research Council in 1947 to provide a research service to the construction industry of Canada. Construction accounts for almost one fifth of the gross national product; this is a reflection of the intense activity in the physical development of Canada. The construction industry is therefore the leading industry of the country; the provision of its research service is correspondingly a challenging task. Associated with this major responsibility of the Division is the provision of a special research service in the housing field to Central Mortgage and Housing Corporation. The Division also furnishes the Associate Committee on the National Building Code with its secretarial service and technical support, and in this way has liaison with all the provinces and municipalities of the country in connection with their building work.

The word "building" in the Division's title, as also in all its work, comprehends not only the erection of buildings and other architectural work, but also all public works and civil engineering design and construction. There is not, unfortunately, a single word in either of Canada's two languages that adequately describes the varied operations that make up the work of the construction industry and of the associated design professions, but "building research" has come to be a generally accepted term used to describe the related research service. The Division does not engage in any consulting architectural or engineering work. It provides rather a complement to the work of the two design professions, engineering and architecture, to that of the contractors — general and specialized — who develop the designs into completed works or structures, to the varied operations of the manufacturers of building materials and equipment, and to the work of a very large number of Canadians who make up the working force of the industry.

The main task of the Division is essentially that of providing information — in design work, in relation to construction problems on the job, in connection with materials and their properties, or even in assisting with the analysis of difficulties, poor performance, or failures. Information is sought first in the Division's library. If not there, a search is made in the private records of other building research work available to the Division from all over the world. If still not available, then its procurement is the stimulus for actual experimental research work in the laboratory or in the field. It is a prime responsibility of the Division to make available the results of all its own research work in convenient form for public use; its Publications Section is therefore second only to its Library as an essential part of its organization.

The provision of this building research service in the field of housing is a special responsibility of the Division, in keeping with its association with Central Mortgage and Housing Corporation. The Corporation is a crown company, formed in 1946, to coordinate all federal interest in housing and to administer the National Housing Act. The Corporation itself is engaged in several branches of the complex of studies which together make up housing research. It is in connection with the technical aspects of house design and construction that the Division and the Corporation co-operate closely. The Division also works directly with the house building industry. The wide public concern in housing, and its major place in the economy of Canada, lend full support to the importance with which all housing research is viewed within the Division.

The National Building Code, an advisory document published at cost by the National Research Council, is in wide use throughout Canada as a municipal building regulation, through local legal adoption. It must be kept continually up to date. Close association of its development (under an Associate Committee of the Council) with an active building research organization is therefore essential. The Code thus benefits by the latest information in building technology; the Division benefits through the links which its work for the Code gives it with building regulations in every part of the country.

DBR Policies

At the start of the work of the Division, in deciding which aspects of work were the most important, it was always remembered that there were factors in Canada that made building in this country different from that in other countries, of which the two main ones are Canada's geology and climate.

Geology determines foundation conditions and the availability of natural building materials; climate determines the conditions to which buildings are subjected and the conditions that must be overcome if the buildings are to be comfortable for use. In addition to the fundamental factors of climate and geology, which point the way for the research activity of the Division, there are some basic principles that are being followed.

Insofar as possible, the Division concentrates on problems that must be studied in this country. The Division has such close links with building research organizations in other countries that it is able to draw on their experience with more general problems whenever necessary.

Another general principle is that the Division's work will not duplicate that being carried out elsewhere in Canada. This is ensured by close co-operation with Federal Government Departments such as the Department of Energy, Mines and Resources, with provincial research councils, universities, and organizations such as the Research Division of the Hydro-Electric Power Commission of Ontario.

All the work of the Division is ultimately directed toward the improvement of building in the whole of Canada. To ensure nation-wide service the Division has regional stations in Halifax, Saskatoon, and Vancouver.

Advisory Committee on Building Research

As the work of the Division covers so wide a field of interest an Advisory Committee on Building Research has been established. The advice given to the Division by this Committee, which meets annually, has proved extremely valuable.

NATIONAL RESEARCH COUNCIL OF CANADA

The National Research Council of Canada is the short title of the Honorary Advisory Council for Scientific and Industrial Research of Canada. Members of the Council include the President, Vice-Presidents (scientific [two] and administrative) as permanent officers, and seventeen others each appointed for a three-year term and selected from industry, labour, and university science departments. The function of the Council is to act as the national civilian research agency and advisor to the Federal Government on scientific research excluding that carried out for defence, agriculture, mining, and forestry. The President of the Council reports to the Chairman of the Committee of the Privy Council on Scientific and Industrial Research. The Council is thus a public agency supported by public funds and reporting annually to the Parliament of Canada, but which is permitted a greater measure of flexibility in operation than would be possible as a Federal Government Department.

The Council was formed in 1916 and for some years acted in an advisory capacity only. In 1927 research laboratories were set up and in 1932 the building on Sussex Drive in Ottawa was opened. The development of the Montreal Road Laboratories on a site 5 miles from the centre of Ottawa began in 1938. Today the Council has a total staff of about 3,000. It carries out its research through divisions of Biosciences, Building Research, Chemistry (Pure and Applied), Mechanical Engineering, National Aeronautical Establishment, Physics (Pure and Applied), Radiation Biology, and Radio and Electrical Engineering. NRC laboratories outside Ottawa include the Prairie Regional Laboratory in Saskatoon and the Atlantic Regional Laboratory in Halifax.

The National Research Council of Canada is unique because of the way in which it is organized, financed, and allowed to carry on its work. These features determine in large measure the favourable conditions under which all the Divisions within the Council can operate.

NATIONAL RESEARCH COUNCIL — ITS INTEREST IN BUILDING RESEARCH

The Council's interest in studies relating to building research may be said to date from 1918 when an NRC publication was issued on the heating of houses. Throughout the years this interest increased. As early as 1932 the first of a number of meetings was held to discuss various aspects of construction. These meetings led eventually to the setting up, jointly with the Department of Finance, of an administrative committee which prepared Canada's first National Building Code, issued in 1941.

Before the formation of the Division of Building Research, the Council had set up at least six associate committees to investigate problems relating to building, besides issuing several publications pertaining to the field of building research. Two of these committees, one dealing with soil and snow mechanics and the other on the National Building Code, are still active and still play a large part in DBR activities.

Some research into building had been carried out at the Council by the Division of Physics on acoustics and heat transmission, by the Division of Mechanical Engineering on testing of heating appliances, and by the Division of Chemistry on paints. The Second World War halted the expansion within the Council of activities designed to meet the research needs of the construction industry. In September 1945 a meeting was held in Ottawa at which was reviewed the whole subject of building research in Canada. The decision to establish a building research agency as a new Division of the National Research Council was made in 1946 and action taken to form the Division in 1947. Two special requirements made this development desirable in addition to the recognition of the general need for building research. These were the revision of Canada's 1941 Building Code and the provision of technical support to the newly established national housing agency — Central Mortgage and Housing Corporation.

DBR BUILDINGS

The Building Research Centre in Ottawa is composed of one main building, a building physics building, and a fire research laboratory. All of these are part of the Montreal Road Laboratories of the Council.

The *main building* accommodates all the Ottawa offices and laboratories of the Division except those of Building Physics and Fire Research. The exterior conforms with the other buildings on the site — stucco on terra-cotta tile and finished in white.

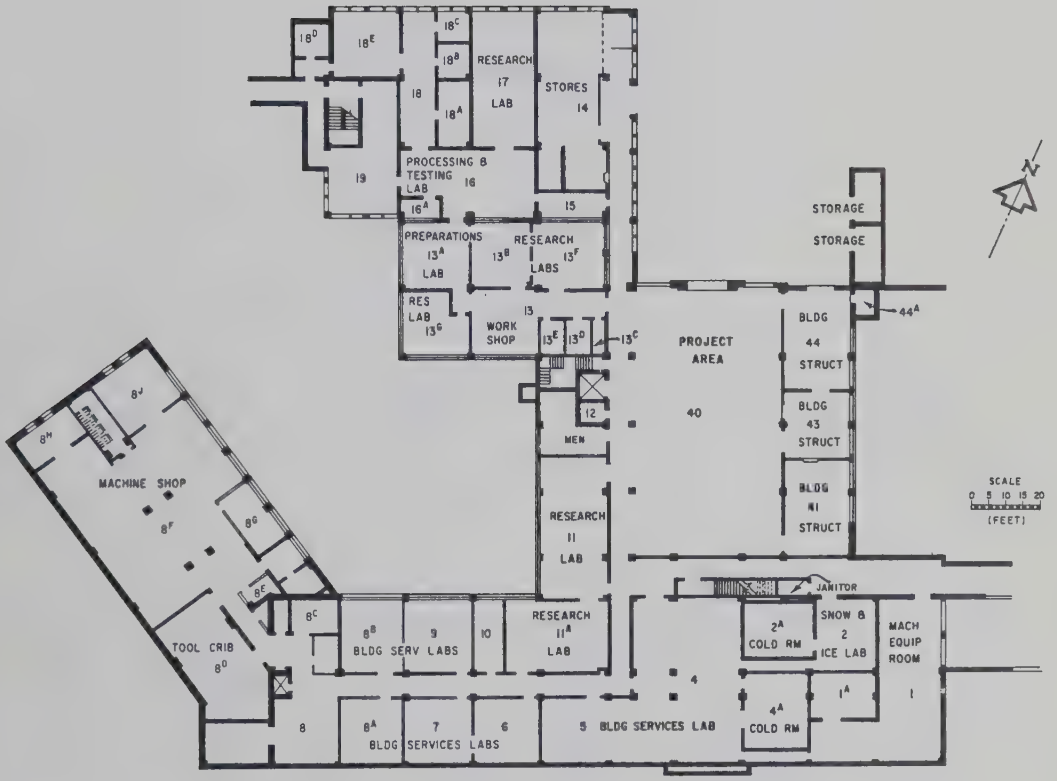
The plan of the building is basically a large T with an additional laboratory wing added to the stem. Those activities of the Division involving mainly office work are housed on the first and second floors of the cross of the T. The rest of the area is devoted to laboratories and offices of the laboratory staff. The stem of the T is comprised of a structural testing laboratory three storeys high which houses a universal test frame. Smaller laboratory facilities are provided on the three floors of a wing at the rear of the building. The building is not generally air-conditioned although there are several specially conditioned rooms in the basement under the front office portion. The conference room is also air-conditioned.

This building, completed in 1953 and believed to be the first erected to serve the general needs of building research, has a gross floor area of 98,050 sq ft and a total building volume of 1,310,500 cu ft. Machinery for services to the laboratories is housed in the basement and in a fourth-storey penthouse.

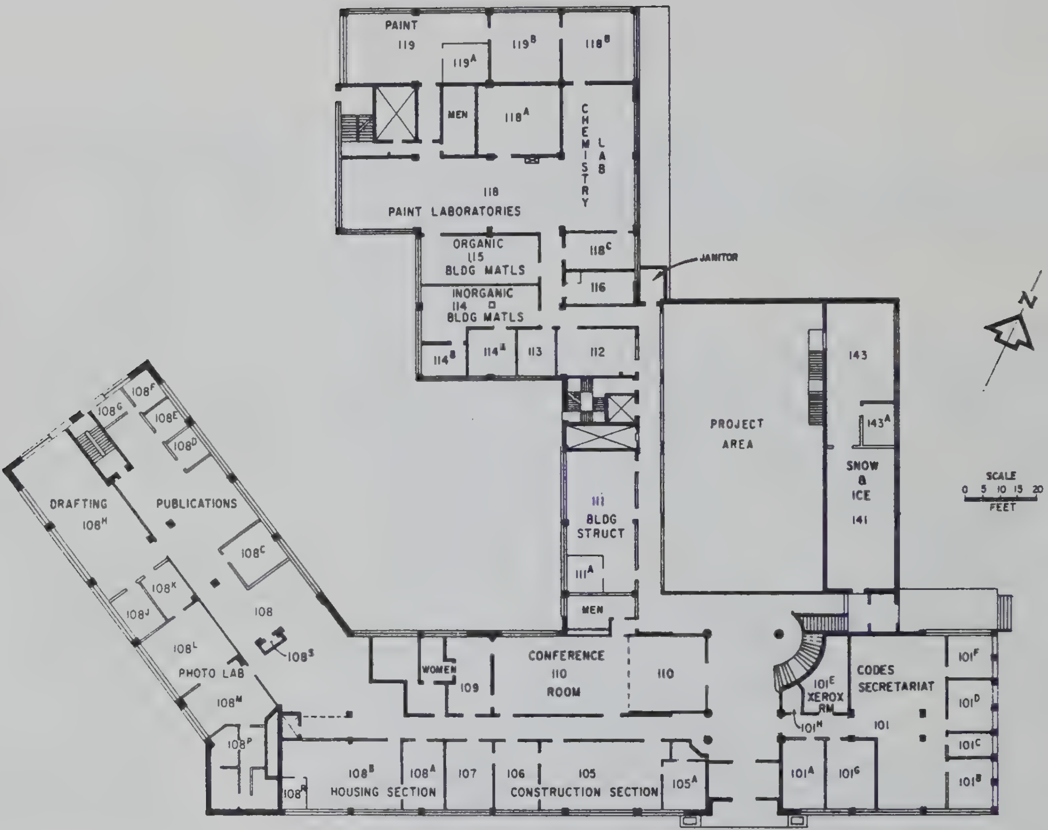
An area of four acres at the rear of the main building has been assigned to the Division for outdoor experimental work.

Aerial view of Montreal Road Laboratories, NRC, where the Division of Building Research is located.

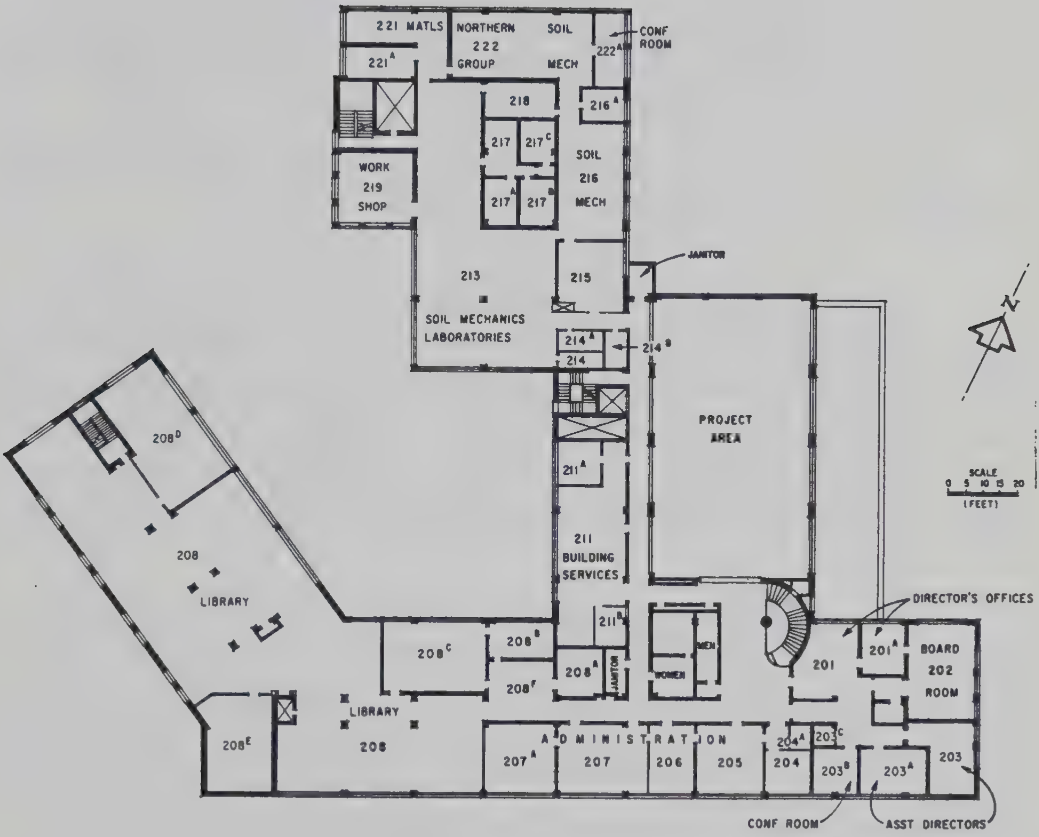
Front entrance to the Building Research Centre



Plan of basement floor, DBR Main Building (M 20)



Plan of first floor, DBR Main Building (M 20)



Plan of second floor, DBR Main Building (M 20)

The *Building Physics building,* adjacent to the large main building, has a gross floor area of 9650 sq ft and a building volume of 126,000 cu ft. Here problems of acoustics and vibrations are dealt with as well as special problems of illumination.

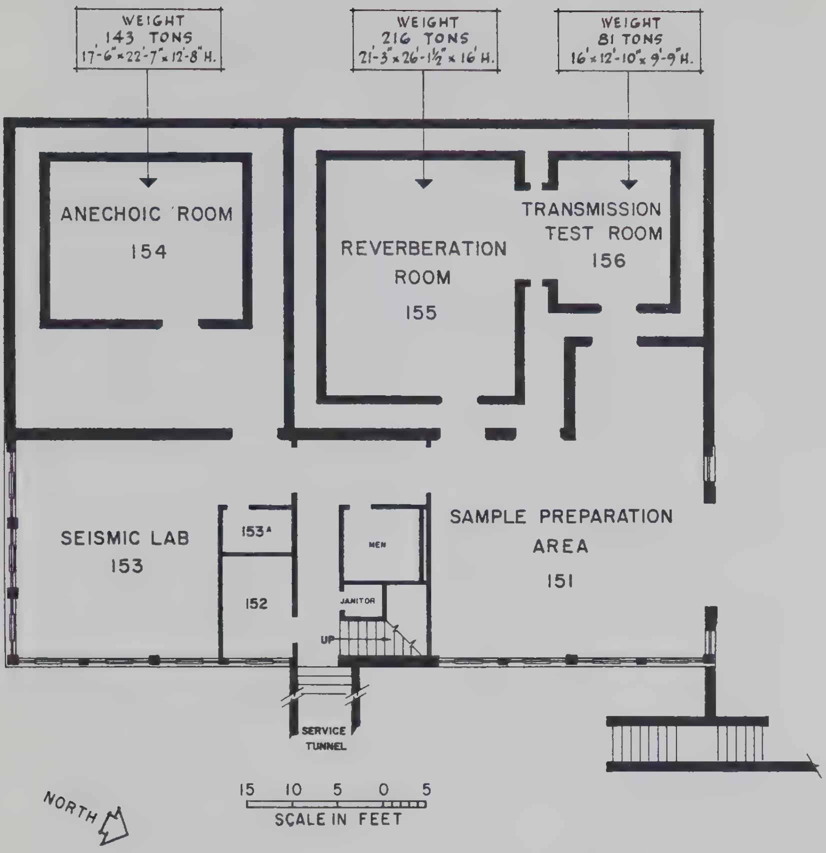
A large bare room, designed with a long reverberation time, is used when determining the amount of sound absorbed by a sample of acoustical material. Rooms next to the reverberation chamber are used for sound transmission tests on wall and floor panels.

There are two other special rooms: an isolated anechoic room for general acoustical studies and a seismic laboratory.

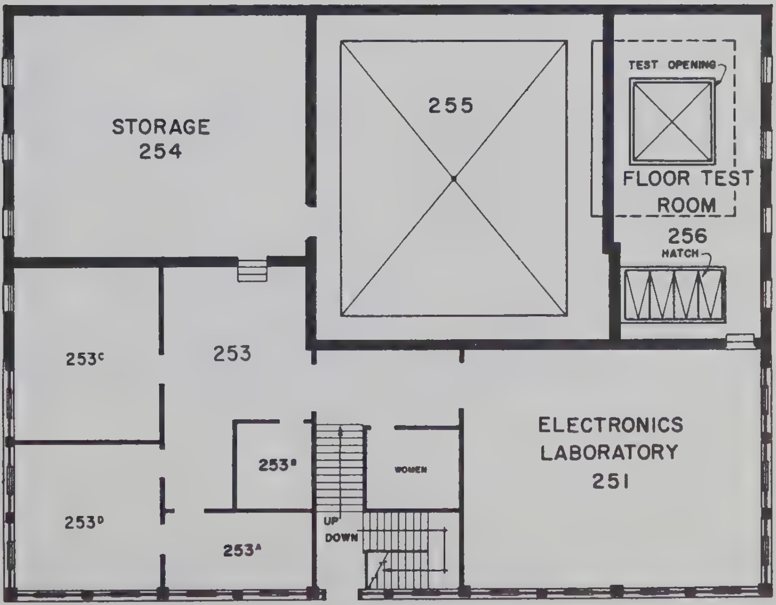
The *Fire Research building* is located south of the main building on the opposite side of the highway that runs through the Montreal Road property. There were several advantages to this location: solid rock close to the surface (desirable for the furnace laboratory foundations) and a large area behind the laboratory remote from other buildings that would be suitable for an outdoor burn test site.

This T-shaped building, with a gross floor area of 20,000 sq ft and a building volume of 550,000 cu ft, was completed in 1958. The front part provides facilities for conducting laboratory work such as evaluating extinguishing agents, and studies of combustion and spread of fire. The chemical aspects of fire are dealt with in the southern wing and the physical aspects in the northern wing. Offices and a small library are located in the front portion of the building.

The remainder of the T consists of a structure 160 by 40 by 40 ft high which includes a furnace laboratory and a burn area. The former houses the furnaces for fire resistance testing which will accommodate wall specimens 12 ft sq and floor specimens 12 by 15 ft. The burn area is for experiments on the development of fire.

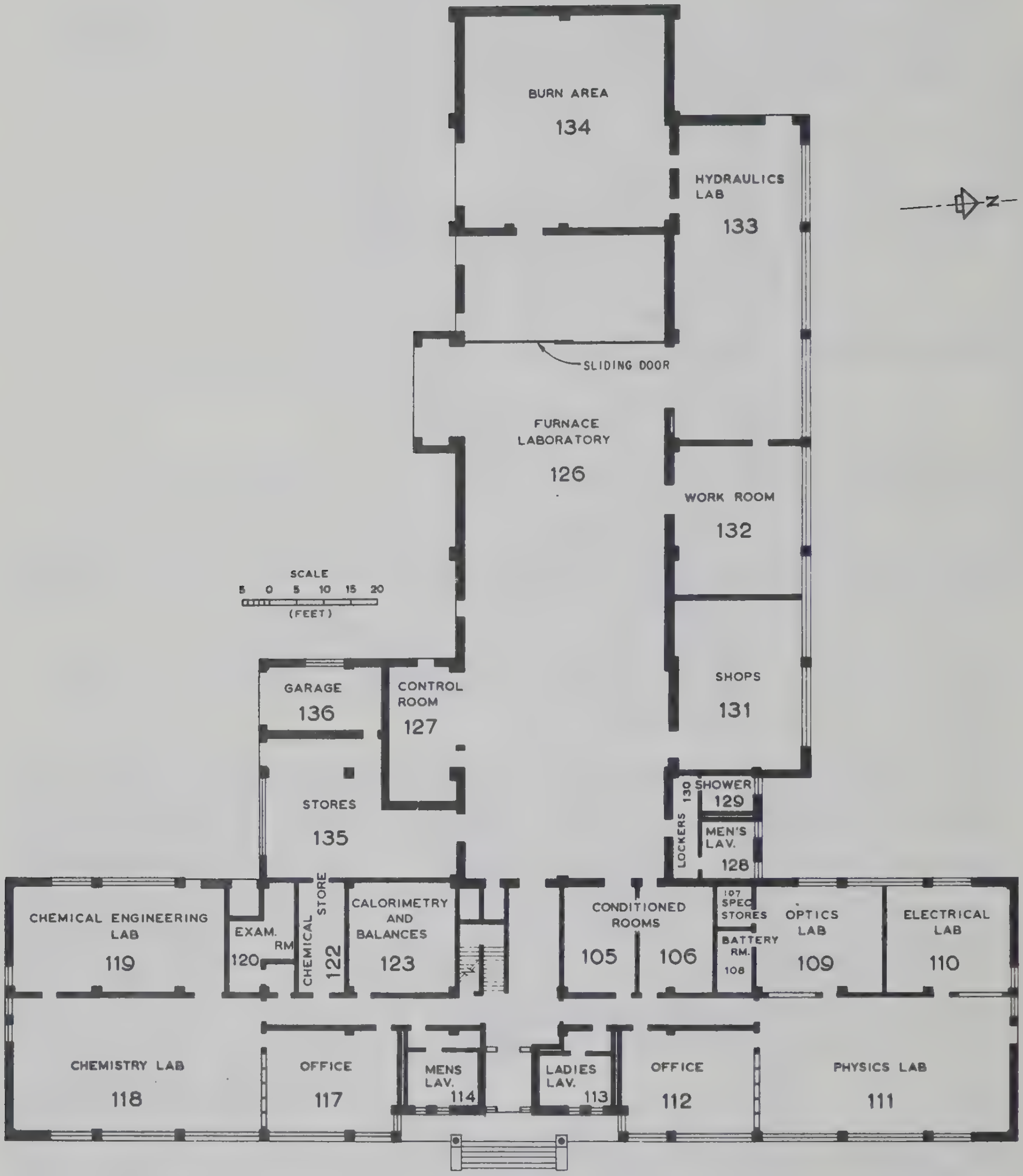

WEIGHT 143 TONS 17'-6"×22'-7"×12'-8"H.
WEIGHT 216 TONS 21'-3"×26'-1½"×16'H.
WEIGHT 81 TONS 16'×12'-10"×9'-9"H.
ANECHOIC ROOM 154
REVERBERATION ROOM 155
TRANSMISSION TEST ROOM 156
SEISMIC LAB 153
153A
152
MEN
JANITOR
UP
SAMPLE PREPARATION AREA 151
SERVICE TUNNEL
NORTH
15 10 5 0 5
SCALE IN FEET

Plan of first floor



Plan of second floor

Building Physics Building (M 27)



Plan of first floor, Fire Building (M 59)

GENERAL ORGANIZATION OF DBR

The work of the Division can be divided into two areas of work: Building Science and Building Practice.

Building Science is the term given to those sections whose main concern is laboratory research. This is conducted within the Division by eight groups. There are sections responsible for Snow and Ice research, Fire research, and Soils and Foundations including a Northern Group. This last section is closely related to the work of the Building Structures Section which is responsible for work relating to structural performance under Canadian conditions. Their work inevitably touches upon building in general and so this Section works closely with the Building Physics, Building Services, Organic Materials and Inorganic Materials Sections. A climatologist serves the Division, working in the Snow and Ice Section.

By the other phase of the Division's work, "Building Practice," is meant assisting in the application of research results in the practice of building and dealing with building problems as they relate to a whole structure. This function may be described as "bridging the gap" between research and practice. The groups concerned with this phase are the Sections on Construction, Housing, Codes Secretariat, Publications, and the Library. To some extent, each research Section in the Division shares in this responsibility just as each building practice section is engaged in specific research projects. The two phases, Building Science and Building Practice together constitute building research in its full sense. For not until the technical information gained in the laboratory reaches the men in industry can the project be considered complete.

Organic Materials

This Section is primarily concerned with paints and protective coatings, the bitumens for roofing and waterproofing purposes, the organic materials that are used in sealants, and plastics for roof, floor and wall coverings. Studies are undertaken to determine their physical and chemical properties and to relate these properties to their performance in use in different environments. The development of methods of testing to assist in evaluating these materials for particular functions and in providing technical assistance for the preparation of specifications for them is an equally important part of the Section's work.

To carry out this work a number of special facilities have been provided. Conditioned rooms with controlled temperature and relative humidity atmospheres are available. The laboratories have been well equipped to enable both routine and special measurements to be made on these materials. Although the development of special coatings, as in the case of paints, is not a main function, paint manufacturing equipment has been provided to enable special coatings to be made from the basic materials when the need arises.

Organic materials are subject to the effects of natural weathering. Studies are therefore of particular interest which provide information about their weathering and what properties are factors in their field performance. Six Weatherometers and one Fadeometer, all operated under closely controlled conditions, are in use. Although the time required to complete a test may be substantially reduced, difficulties in interpreting the results may arise due to the increased severity of test conditions. To assist in judging performance and to correlate their behaviour with natural weathering conditions, seven outdoor exposure sites have been established across Canada. These sites are located at Ottawa, Saskatoon, Montreal, Halifax, Norman Wells, N.W.T., and Rocky Point, B.C. and provide a range of rural, urban, industrial and marine atmospheres to expose both organic and inorganic materials.

Inorganic Materials

This Section is responsible for the study of the stability and durability of inorganic building materials such as concrete and its constituents, concrete products, unit masonry and mortar, and gypsum and lime. The stability and durability of these materials are related to a number of physical, chemical and physico-chemical processes common to many porous systems. Through fundamental studies of the relationship between sorption of water and the resulting dimensional changes of porous materials, it is possible to gain an understanding of the process of swelling on wetting and shrinkage on drying. Similarly, to understand the mechanism of the failure of materials due to cyclic exposure to freezing and thawing conditions, the phase change of water in porous systems must be understood.

Other studies by the Section include the physical and chemical properties of inorganic building materials when used singly or in conbination with other materials, and how these are affected by changing environmental conditions. Such studies are undertaken to improve the understanding of the performance of these materials in service. In specific cases, mineralogical, crystallographic, or chemical studies may be pursued to resolve the reactions involved in the processes of formation or deterioration. Available to the Section are the seven exposure sites across Canada and at some of these work is underway to assess the contribution of the various weather factors to the deterioration of cementitious materials and the corrosion of metals.

Special equipment and facilities have been provided for testing and studying the behaviour of materials under a variety of controlled conditions. Several special rooms and chambers providing controlled atmospheres for both routine and special work are an important part of the Section's facilities. Although commercial testing of materials is not one of its functions, the Section is well equipped for testing according to specifications in use in Canada.

Building Services

The Building Services Section is concerned primarily with the environmental engineering aspects of building research. This includes studies on the characteristics of building enclosures as environmental separators (heat, radiation, moisture, air, rain), energy requirements for heating and cooling, heat and moisture transport properties of insulation and other materials, the performance of mechanical services in buildings including water and drainage systems, and environmental conditions in buildings in relation to human comfort and well-being. All work carried out in these fields has a particular relevance to Canadian climate or building practice.

One major area of study concerns the heat, moisture, and air flow characteristics of building elements. Large-scale laboratory equipment has been developed for heat transfer, condensation, rain and air leakage observations on insulations, windows and other building components. Facilities are also available for measuring water vapour permeability characteristics of materials, such as insulation and moisture barriers, and for evaluating the adequacy of sealing systems in factory-sealed double-glazing units.

Improved methods and data have been developed for calculating loads and energy requirements for heating and cooling of buildings to permit improvements and economies in the design and selection of building components and equipment. Emphasis is on the application of digital computers to these problems.

Air leakage in buildings is important in relation to both heating and cooling loads and condensation problems. Studies of air pressure distribution and the pattern of air flow in large buildings form a part of the program. Studies are also made on ground temperature distribution and heat transfer adjacent to structures in or on the ground. This work includes the development of analytical solutions for typical structures, e.g., foundations, tunnels and buried pipes. Mechanical equipment studies have been concerned mainly with heating appliances and chimneys.

Building Structures

The Building Structures Section is mainly concerned with the strength and deformation of buildings and civil engineering structures, as well as the loads to which these are subjected.

There is a general need for improved knowledge and a more realistic assessment of climate and occupancy loads such as snow, wind and floor loads, with the general aim of refining the "design loads" in the National Building Code. As snow loads are very important in designing roofs in Canada and because large variations occur in the magnitude and distribution of these loads, a country-wide survey has been made of actual snow loads on roofs. From the results, shape factors have been developed to account for the drifting of snow from one part of a roof to another and these have been included in the Code. In the field of wind loads, wind pressure measurements are being made on high-rise buildings in an effort to check the validity of the design wind loads in the Code and to improve the proper consideration of the dynamic aspects of wind loads.

The behaviour of structures under load is frequently best studied by doing loading tests on full-scale structures and elements. Many load tests have been carried out on roof frames, including trusses, and full-scale roofs. To carry out this work, the Division has available a special testing installation in the large three-storey laboratory permitting the erection of structural steel frames around a test object and the application of measured loads at any desired point by means of jacks.

Other work of the Section is concerned with connections in precast concrete, creep in concrete, studies of structural failures, and the effect of variations of loads and strength on structural safety. The Section is also asked to assist with jobs for Central Mortgage and Housing Corporation, the Associate Committee on the National Building Code, and several national and international committees.

Building Physics

This Section is concerned with applications of physics to building problems, with special responsibility for problems of vibration and acoustics. In vibration work, the subject matter ranges from the effect of earthquakes on buildings to the isolation of vibration sources within buildings. A matter of special importance is the possibility of building damage due to blasting, pile driving and similar disturbances. The Section deals with special problems of this type, and has facilities for making field studies of vibration.

In acoustics, the Section maintains special laboratories for standard sound absorption and sound transmission tests on building components. A major research topic is the improvement of these test facilities and the development of new test methods for use in the laboratory and in the field. In addition, certain applied problems in noise control and architectural acoustics are studied, mainly to provide quantitative information about proposed acoustical design procedures.

Climate

Climate plays an important role in any organization engaged in building research. It is of special concern in a country like Canada which has such wide climatic variations. Normal annual snowfalls range from less than a foot to over 30 feet; extreme temperatures cover a range of 194 F degrees.

The importance of climate to Canadian building research was recognized from the start of the Division and for 15 years a meteorologist has been seconded from the Department of Transport's Meteorological Branch for full-time work with DBR.

One of the major tasks of the meteorologist has been the preparation and periodic revision of information for the climate supplement to the National Building Code. He also serves as a consulting meteorologist for DBR and the construction industry.

Fire Research

The Fire Section is responsible for conducting research aimed at reducing the life and property losses by fire in Canada. High priority is given to problems associated with Building Code requirements as it is through building regulations that the greatest progress can be made in effecting better protection from fire in buildings and for building occupants.

Of major interest to the Section is the spread of fire within a building and the hazard of its spread to adjacent buildings. Studies have been undertaken on the amount of necessary separation between buildings in order to minimize the exposure hazard. A characteristic study concerning the spread of fire within a building is an investigation into the effect of lining materials on the spread of fire in corridors. Effective compartmentation of buildings depends on the fire resistance of the enclosing elements. One of the Section's major studies is concerned with the fire resistance of building elements such as floors, walls, beams, and columns. Large-scale furnaces are available for carrying out standard fire resistance tests. Special laboratory facilities have been provided for studying the thermal and mechanical properties of materials at elevated temperatures in order to gain a better understanding of the behaviour of constructions when they are exposed to fire. Members of the Section continue to investigate fires as a supplement to laboratory studies.

The thermal decomposition products of various plastic materials are determined. These data are useful in analysing the toxic hazard of different materials when they are involved in fire.

The Section is also concerned with the extinguishment of fires utilizing various retardants and extinguishing agents. These studies involve the use not only of conventional materials and techniques, but include development work on new agents and methods of application for use at building fires.

Snow and Ice

This Section studies the properties of snow, ice, snow covers and ice covers, with particular reference to information concerning them required for design, construction and operational purposes.

Snow and ice exist because of weather. Considerable attention is given, therefore, to the interrelationships between these materials and weather and climate. The Section studies, for example, the influence of snow cover on ground temperature and the factors controlling the formation, growth and break-up of ice covers on lakes and rivers.

Frozen lakes and rivers are widely used in Canada for transportation purposes. Structures are often constructed in lakes and rivers where they are subject to the movement of ice covers and the associated forces. The Section is accumulating the knowledge required for predicting the forces that ice covers can exert against structures and the loads that can be placed safely onto covers under given conditions.

A knowledge of how ice deforms and fails under load is required for a proper understanding of the behaviour of ice covers and the forces that they are capable of exerting. The Section has a cold room facility whose temperature can be varied between +40°F to −60°F and held constant at a given temperature to within ±0.5°F. In this room investigations are conducted on the dependence of the elastic, plastic and failure behaviour of ice on temperature, stress and time.

Avalanche prediction and control are necessary for many mountainous areas in Canada. Extensive work on this problem has been carried out in Switzerland and the Division has been fortunate to be able to draw from this experience for application to Canadian conditions. The Section is accumulating the knowledge required for predicting the danger due to avalanches and for designing and constructing avalanche defence systems.

Soil Mechanics

The function of the Soil Mechanics Section is to improve engineering design and construction techniques in which the performance of soil is an important consideration. Most of the problems studied are intimately related to the climate and geology of the country. Owing to the size of Canada, wide variations in climate are encountered, ranging from the temperate conditions of the South to severe arctic conditions in the North. The geology of Canada is as variable as the climate and includes the Precambrian Shield (which dominates half the land area), the great plains of the Prairie Provinces, and the northern arctic belt.

These wide variations produce a correspondingly broad range of foundation problems. Many which are peculiar to sparsely settled or recently developed areas are aggravated by a lack of experience with them. There are, in addition, serious regional problems with frost action, landslides and mud flows, organic terrain (muskeg), and swelling and shrinking clays.

In the North of Canada one of the special problems of engineering construction is permafrost — the term used to describe ground that remains frozen throughout the year. Permafrost is not the name of a new material but is the frozen equivalent of materials found in Southern Canada. If the frozen material is a saturated silt, as is often the case in the Canadian North, the placing of a heated structure on the permafrost may cause it to become a slurry and result in serious settlement damage to the building. A special group within this Section is engaged in research into these northern problems.

The Section is equipped for all routine soil mechanics tests and for a good deal of highly specialized testing. Extensive site investigation work is carried out both in temperate and in permafrost regions. The work of the Section is about equally divided between studies of soil material in the laboratory and the study of the performance of soil in the field.

BUILDING PRACTICE

Construction

One of the main activities of this Section is the answering of the many technical inquiries that come to the Division from architects, engineers, builders, suppliers, manufacturers, Government officials, and individuals. Most of these inquiries ask for basic information on the properties of construction materials and the manner in which they should be assembled to control the movement of heat and moisture through them. In replying to these inquiries the Section correlates the information obtained from all of the research sections which may be interested in some aspect of the problem. This service is not intended to be a consulting service, and cannot deal with questions related to the planning of buildings, or indicate in any way the comparative merits of commercial products. The inquiries do, however, provide a valuable means of communication with the construction industry and often indicate the need for research in certain fields. Many projects of the Division have been initiated as a result of inquiries to the Section.

The Section maintains close liaison with the building industry through membership in and participation in the work of the Canadian Construction Association and the local Builders' Exchanges, through visits to construction sites and through discussions with construction men about the problems of the industry. The knowledge gained from these contacts benefits not only the Building Practice staff but also the Building Science specialists who must keep in touch with practical developments in their field.

The Construction Section is also concerned with studies of the performance of buildings. Investigations are made of such elements of the building as curtain walling and built-up roofs. Buildings are also examined to determine why construction materials fail to function properly. Studies of this nature provide much information of value to architects and engineers in the design of buildings.

Housing

The existence of a separate section within the Division to deal with housing problems is recognition of the fact that house construction comprises a large part of Canada's annual construction program.

Much of the Division's work in housing has been undertaken to assist CMHC in their program of acceptance of materials, equipment and building systems for use in construction under the National Housing Act. Often there are no specifications on which to base acceptance of the many new materials and systems being offered and the evaluation of these has provided one of the most challenging aspects of the housing work.

Past housing studies have included the development jointly with Forest Products Research Branch of standard roof truss designs, a survey of the use of prefabrication methods in Canadian housing, and the evaluation of the role of plastics in house structure. More recently the work has been extended to encompass a review of structural sandwich developments as well as a detailed survey of industrialized building systems in use and under development in Europe. A start has also been made in the important field of construction productivity studies utilizing work study techniques to analyze the labour and material requirements for typical Canadian housing.

These activities relating to the construction, performance and economics of houses in Canada are important parts of a comprehensive program of housing research. The steady development of such a program related to Canada's regional needs including the far northern areas is a real challenge and the Division looks forward to continuing its program in this field in close co-operation with CMHC and the house building industry.

Codes Secretariat

The chief responsibility of the Codes Secretariat is the provision of secretarial services for the Associate Committees on the National Building Code and the National Fire Codes of Canada. The Codes are advisory documents available to municipalities and other authorities in preparing or revising their own bylaws. They are acknowledged as the standard reference building and fire codes in Canada.

The National Building Code was first published in 1941 in recognition of the need for a greater uniformity in building regulations as a measure to effect economy and reduce waste in building construction. Architects, engineers, fire officials, and many other national groups promoted and assisted in its preparation and development.

In 1948 the NRC formed the Associate Committee on the National Building Code, thereby providing a continuing committee to keep the Code up-to-date and to promote its use. The Committee instigated a complete revision resulting in the National Building Code (1953). This was later revised in 1960 and again in 1965. It is planned to issue a revised edition of the Code every five years.

The National Fire Code is prepared by a separate Associate Committee which has also issued a Municipal Fire Department Code and a Volunteer Fire Department Code.

The association of the Codes with building research has enabled special studies and research to be carried out. As a result they are unique in several respects. Principles have been developed on the arrangement of the subject matter and studies have been made on certain aspects of the technical content. Both Associate Committees are supported by special technical committees who contribute to the continuing development of the Codes and to the promotion of improvement in building generally. The Codes have been published in English and in French.

The Codes Secretariat also contains a special unit whose task is to provide service for arranging special meetings and conferences of interest to the Division.

Library

From its start in 1947, the Division has been building up its library collection to provide the DBR staff, as well as the Canadian construction industry, with the best possible coverage of their many fields of interest. Besides the direct needs of the Division in all construction and building topics, the library also serves the special needs of the Associate Committee on the National Building Code. It has extensive holdings in the fields of construction, architecture, building materials, soil mechanics, heating, fire, building standards, building codes, and snow and ice engineering. In addition to its holdings in the form of books, reports, and pamphlets, the library tries to maintain an up-to-date collection of trade literature. The library also has a small collection of films that can be borrowed.

Each month, the Library issues a report *Recent Additions to the Building Research Library;* biannually a *Selected List of Books Received by the Building Research Library* is published. Both of these reports are mimeographed and are free of charge. The Library would be pleased to send copies to anyone interested in being kept informed of new information available in the many fields relevant to building research. Anyone wishing to receive copies of these as issued is asked to write to the Division.

The DBR Library is one of the most important services offered by the Division; its use by all those engaged in construction in Canada is encouraged.

Publications

This Section, together with the other Building Practice Sections, is devoted to bridging the gap between building science, the building industry, and the home owner. The processing and distribution of the technical information gained by Divisional studies are the responsibility of this Section.

The publications of the Division take many forms; all have a definite function in trying to inform different interested groups.

To the greatest degree possible, the Division tries to have its papers published in scientific or technical journals, or in proceedings of professional or technical societies. Reprints of these are obtained and issued as DBR Research or Technical Papers. Each month the Division issues a printed, 4-page *Canadian Building Digest;* other series include *Housing Notes, Fire Studies,* and *Building Research Notes.* Twice a year, *Canadian Building Abstracts* are published. This is a list of abstracts, in English and in French, of articles pertaining to building research that have appeared in Canadian scientific or technical journals. *Building Research News,* a printed 8-page leaflet reporting items of DBR activities, is issued four times each year.

A list of DBR publications is available. Anyone wishing to receive this list and the interim supplements may do so by writing to the Division.

Administration

Services. — The Division does not have to provide all of its own administrative and other services as the NRC has a central administrative organization to serve the whole Council. DBR has a small, parallel arrangement of services for its intramural operation that provides modest workshop services, stores, a drafting office, darkroom and photographic services, local mail and subregistry, purchasing, transport, and personnel.

Budget and Finances. — The Division is financed from funds provided by the Parliament of Canada in the form of a block vote to the NRC. The yearly DBR budget is made up on the basis of estimates prepared for each of its Sections. The Division makes charges for the full cost of such special testing as it does carry out for private individuals, firms, and agencies. In the case of special testing carrying with it some element of research of more general interest the Division may assume part of the cost. Priority is given to work that is expected to benefit a number of firms or a substantial segment of the construction industry.

DBR Regional Stations

DBR regional stations in Halifax, Saskatoon, and Vancouver were established primarily to provide an information service to those concerned with building in these areas. Information is provided by answering technical inquiries and the distribution of technical literature on all phases of building. The Stations at Halifax and Saskatoon have facilities to carry out research which is directed toward construction problems that are peculiar to their regions. Research support for the operation of the B.C. Regional Station is provided by the B.C. Research Council and other research agencies in Vancouver. Personnel at all three stations participate in DBR nation-wide projects, such as the snow survey and exposure site programs. Close links are maintained by the Stations with regional engineering and architectural associations, builders groups, building inspectors, and district offices of CMHC.

The *Atlantic Regional Station,* which is housed in the NRC Atlantic Regional Laboratory, began operation in 1955. The main research investigations carried out at the Station relate to masonry and protective coating problems under local climatic conditions. This work supplements that carried out in the Materials Sections but is directed toward local materials and building problems.

The *Prairie Regional Station* was established in 1948 in the NRC Prairie Regional Laboratory of NRC on the campus of the University of Saskatchewan. The research program of the Station includes the study of the performance of buildings and building materials under Prairie weather conditions and the investigation of foundation problems related to the physical and chemical characteristics of Prairie soils.

The *British Columbia Regional Station* was established in 1956; the office is located in the B.C. Research Council, on the campus of UBC. The Station provides a technical inquiry service and undertakes field studies of building problems when required.

Associate Committees

When a major inquiry into a subject of general interest to Canada is proposed, the Council may decide to refer it to an associate committee composed of leading authorities in the particular field who are invited by the Council to study the problem. Associate Committees do not undertake research; they may designate projects for study and suggest where and by whom they should be carried out.

This method of stimulating co-operative research has proved extremely effective. DBR is closely associated with the work of four NRC Associate Committees. Divisional links with the Associate Committee on the National Building Code have been outlined in the section dealing with Building Standards. The following notes pertain to the other committees with which the Division is associated.

Associate Committee on Soil and Snow Mechanics. — This Committee is studying the fundamental, physical, chemical, and mechanical properties of Canada's terrain including not only soil, but muskeg, permafrost, and snow and ice. DBR sections on Soil Mechanics and Snow and Ice provide secretarial assistance to this Committee. The work of the Committee is reported in a series of Technical Memoranda.

Associate Committee on National Fire Codes. — This Committee was set up to prepare a Canadian fire code designed to promote uniformity in local fire prevention and fire protective measures. The ultimate objective is the preparation of a National Fire Code for Canada. A member of the DBR Fire Section is secretary of this Committee.

Associate Committee on Paint Research. — The goal of this Committee, which was set up in 1964, is to stimulate and correlate research throughout Canada in the field of chemical coatings. A member of the Organic Materials Section of DBR is secretary of the Committee.

A NOTE TO THE READER

Since the formation of the Division of Building Research in 1947, so much interest has been shown in its activities that this booklet has been prepared as a guide to its work and laboratory facilities.

If there are questions about the Division not dealt with in this booklet, inquiries may be sent to:

The Director
Division of Building Research
National Research Council
Ottawa 7, Canada

The Division maintains a mailing list of those to whom advice of all its publications is sent regularly. Your name will be added to this list if you will send your request to the above address.

Pour mieux servir tous ceux qui sont intéressés aux travaux de recherches sur le bâtiment, toutes les fois que les circonstances le permettent, les publications de la Division paraissent en français. Pour obtenir une liste de ces versions françaises déjà publiées, s'adresser à la Division des Recherches en Bâtiment, le Conseil National de Recherches, Ottawa 7, Canada.

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